



# Teamwork on the line can pay off down the line

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Received 22 April 2010  
Revised 3 August 2010  
Accepted 19 August 2010

## Abstract

**Purpose** – Employees' work in innovation processes generates ideas, but more often it serves to create conditions so that new products or services can be effectively produced or delivered. Self-organizational activities involve proactively handling new possibilities, unexpected situations, problems or tasks. The aim of this paper is to provide support for a previously proposed model of the determinants of self-organizational activities in work groups.

**Design/methodology/approach** – Three studies were conducted in organizations where self-organizational activities are welcomed, and in a nuclear plant where such can endanger safety. The results are based on work analysis (two studies) and questionnaires (all studies) administered to, in total, 104 work groups. The model was tested using LISREL.

**Findings** – The model received substantial support. Dimensions of job design, group processes and group initiative are interrelated and connected to self-organizational activities. Job design captured by work analysis gives a better model fit and has a larger effect on self-organizational activities than self-assessed autonomy.

**Research limitations/implications** – Five different studies with a relatively small number of groups is not a large sample, but the data could be merged.

**Practical implications** – Teamwork can benefit the innovation process and give a return on the investment that it takes, providing that groups have a complex task, considerable freedom, and group processes that are characterized by reflexivity. A good argument for investing in teamwork is that it can promote self-organization. Employees learn to think outside the box and participate in processes that are important for innovation. Work analysis can give input as to how work conditions might be altered to enhance innovation processes. Job design has an effect on group processes that are crucial for learning the competence to handle change.

**Social implications** – Detailed work analysis is worthwhile as it provides data regardless of how work conditions are perceived, and gives a solid base for proposing how the work should be designed if it is to support self-organization. Further, group processes that enhance group initiative and self-organizational activities are identified.

**Originality/value** – The study gives further evidence that teamwork can benefit the innovation process and give a return on the investment that it takes, providing that groups have a complex work task, considerable freedom, and group processes that are characterized by reflexivity.

**Keywords** Team working, Innovation, Employees, Organizational effectiveness

**Paper type** Research paper



## 1. Introduction

The goal of employees' work in an innovation process can be to generate ideas, but more often the goal is to create the right conditions so that new products or services can be produced. Innovation processes require the capacity to create appropriate conditions and organize work so that unexpected problems can be dealt with and new opportunities responded to effectively (North and Guldenberg, 2008; Sawyer, 2007;

Zimmer, 2001). This puts demands not only on the competence to be able to utilize all the uncertainties a change in product/service or work system implies as input to an innovation process, but also the competence to proactively create conditions so that future changes can be dealt with efficiently.

From the perspective of workplace learning, interest is directed towards work conditions, since they provide more or less beneficial prerequisites for developing competence in carrying out stipulated work tasks, and in mastering change. Employees who learn to be proactive at work can be part of change and developmental activities, which in turn can provide a new opportunity for learning qualitatively new tasks. Such learning is essential for both enterprises and for the individual's long term employability.

From the enterprises' viewpoint, the issue as to which organizational solutions will most benefit the innovation process is central. Innovation processes are enhanced by collective learning processes and interdisciplinary cooperation along the entire chain from idea to product or service, and maintenance (Zimmer, 2001). Teamwork can be an effective means for innovative work and give a return on the investment that it takes, providing that groups have a complex work task, and substantial influence over the work itself and the working conditions (West *et al.*, 2004). From the perspective of job design it becomes essential to investigate further how work conditions impact on the groups' redefining of stipulated tasks to include proactive behavior. Crant defines proactivity as "taking initiative in improving current circumstances or creating new ones; it involves challenging the status quo rather than passively adapting to present conditions" (Crant, 2000, p. 436).

In previous research (Brav *et al.*, 2009; Lantz and Brav, 2007), a model of determinants of self-organizational activities in groups was proposed. In the model, job design, group processes and proactive behavior are interrelated and connected to self-organizational activities. The model was tested on work groups on the shop floor in industry and received substantial support (Lantz and Brav, 2007; Brav *et al.*, 2009), but raised questions about the model's generalizability to other contexts. Self-organizational activities are defined as: proactively creating conditions and organizing work so that the group can handle new possibilities, problems or tasks, and handling and mastering unexpected situations, problems or tasks. Self-organizational activities are regulated by the goal of creating conditions so that the unpredictable can be handled, and of mastering a new situation. This might be related to innovation, and it can be argued that the activities are the result of a competence that is essential for the innovation process.

The aim of the present study is to test a theoretical model of relations between dimensions of job design, cooperation, social support, reflectivity, group initiative and self-organizational activities in work groups in different organizational contexts.

### 1.1 The model

The model is presented in Figure 1.

In the model, each arrow represents a hypothesis. The rationale behind the model is explained in the following text.

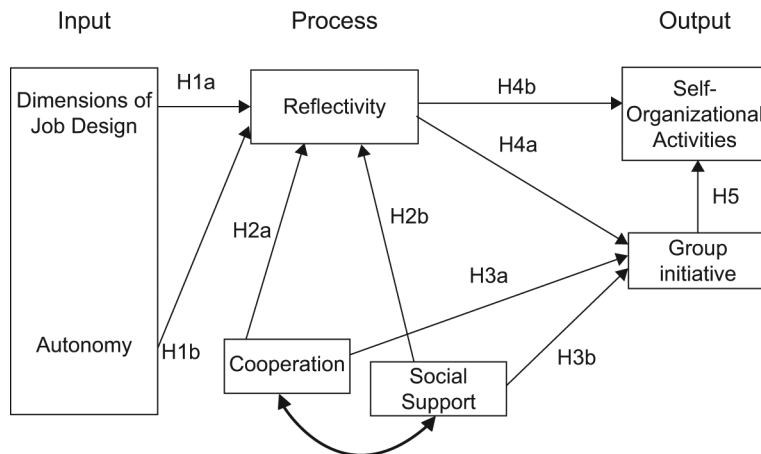
The relations between the prerequisites for group work, group processes and effects are often tested as an input – process – output model (Gladstein, 1984; Kozłowski and Bell, 2003; McGrath, 1984), as is the case with ours. West *et al.* (2004) give substantial

support to the assertion that “team processes provide the core driving force for team innovation and that these processes may mediate the relationship between team inputs and innovation” (p. 91).

Crant (2000) compares four constructs: proactive personality, personal initiative, role-breadth self-efficacy, and taking charge. He concludes that they overlap conceptually and capture an individual’s propensity to engage in proactive behavior. We refer to group initiative in accordance with Frese’s *et al.* (2007) concept of personal initiative as a syndrome “that results in an individual taking an active and self-starting approach to work goals and tasks and in persisting in overcoming barriers and setbacks”. A reconstruction process of work allows employees to define extra-role goals and actions that are self-starting, proactive, have a long-term focus and lie outside role requirements (Frese, 2001). In the model, group processes mediate the relationship between the dimensions of job design and group initiative as the latter presupposes reflectivity and a collective redefinition of the process of work.

Activity theory uses the term completeness to describe if the work task is designed in such a way that it allows the worker to act in a goal-oriented manner and be part of innovative processes (Hacker, 2003). The regulation process of work activities is described and evaluated through two criteria: hierarchical and sequential completeness. Sequential completeness refers to whether the individual autonomously implements a chain of activities from goal-setting and planning to execution and evaluation of the outcome, as these activities provide different cognitive challenges as well as feedback. Hierarchical completeness is evaluated by a careful examination of the means-goal relationship. Does the task put high demands on a mental regulation process characterized by knowledge-based and intellectual processes, or does it consist of low demands? If so, it is carried out on a sensory-motor level and has little potential for learning. Ulich (1990) quotes the Bible to describe the essence of completeness:

And God saw everything that he had made and, behold, it was very good (*Genesis*, Chapter 1, verse 31).



**Figure 1.**  
A hypothetical model of the relations between dimensions of job design, autonomy, reflectivity, cooperation, social support, group initiative and self-organizational activities

A complete job puts demand on continuous learning and puts challenging demands on planning, decision making, and problem-solving capacity (Hacker, 2001).

Previous research has shown that completeness, demands on responsibility, cooperation, cognitive demand and demand on learning are empirically closely related (Lantz and Brav, 2007; Pohlandt *et al.*, 2007; Richter *et al.*, 1999) and related to reflectivity and learning processes in groups (Lantz and Brav, 2007). A complete job will demand cooperation with others. Goal-setting, planning and controlling the results can rarely be done in isolation from others. It is more cognitively challenging and complex than a fragmented job. Evaluation, feedback, and challenging tasks put demands on the preservation and augmentation of learning (Hacker, 2003; Richter *et al.*, 1999).

Hacker (2001, 2003) refers to a redefinition process to explain why some individuals take the initiative to implement change and some do not. The propensity to, on one's own initiative, go beyond the stipulated task and a pre-defined result presupposes that the individual has somehow redefined what the expected result should be. An individual task is regulated in an iterative process of handling motive, goal and activity (Hacker, 2003), but collective behavior is regulated by communication about these issues (Tschan, 2000). Group research has shown the importance of the members' shared, organized understanding and mental representation of the work that the group is to accomplish (Klimonski and Mohammed, 1994; Cannon-Bowers *et al.*, 1993). Reflectivity is defined as "the extent to which team members collectively reflect upon the team's objectives, strategies, and processes as well as their wider objectives" (West *et al.*, 2004, p. 285) and we use reflectivity to capture the collective redefinition process.

### 1.2 The hypotheses

Job design has previously been shown to affect reflectivity (Hacker, 2003; Lantz and Brav, 2007; West *et al.*, 2004). A complete job can provide input to group discussions, since planning and problem solving, as well as evaluation of the outcome, will be part of the group's tasks. Further, the group has to discuss and reflect upon how different sub-tasks and goals are embedded in an overall goal and reach consensus about the coordination of tasks. Job design has been shown to be important for the individual's reflectivity and learning (Hacker, 2003) as well as for group learning and performance (Lantz and Brav, 2007; Ulich and Weber, 1996). *H1a* postulates that job design (captured as organizational prerequisites for completeness, demand on learning, responsibility, cognitive demand and cooperation) impacts on reflectivity in work groups.

Regulation demand is closely related to autonomy (or control). Hacker (2001, 2003) uses the concept of degrees of freedom to describe a worker's choices in a given situation where a higher level of regulation demand implies both a quantitative increase in degrees of freedom and a qualitative increase in the form of autonomy. Greater autonomy increases the scope for using intellectual skills and creates potential for learning and redefining work (Hacker, 2001).

Frese *et al.* (2007) showed that control (influence on work sequence, time frame, work goals, work strategies, feedback and work conditions) influences personal initiative. Autonomy and complexity are theoretically and empirically interrelated since both characteristics refer to decision possibilities. Autonomy is trivial if exerted in jobs with little complexity, because decisions then refer only to unimportant issues

(Frese *et al.*, 2007). Such issues are not likely to put demands on collective reflectivity. Autonomy impacts innovation processes in teams (West *et al.*, 2004) as autonomy in decision-making makes discussions about the work situation meaningful since discussions can lead to a change. *H1b* postulates that autonomy is related to reflectivity.

Cooperation and coordination of work has been shown to be an essential part of effective group work (Kozlowski and Bell, 2003). Inline with Wagner, we define cooperation as “the willful contribution of personal efforts to the completion of interdependent jobs” (Wagner, 1995, p. 152) and include coordination as such an effort. We refer to social support as socio-emotional processes such as social support, psychological safety and trust. Instrumental and social processes are interrelated for many obvious reasons. It is easier to behave in a cooperative manner, to share the workload and coordinate sub-tasks in an amicable climate than in a tense or non-supportive one. A climate characterized by trust, psychological safety and social support facilitates communication about task-related issues (Edmondson, 1999; Kozlowski and Bell, 2003). We assume that cooperation and social support are interrelated.

Reflectivity enables the group to uncover the behavioral patterns that impede effectiveness and creativity (Gersick and Hackman, 1990). Brav *et al.* (2009) argue that a group which has not yet established effective habitual routines will be less prone to collective reflectivity than a cooperative group, since it is too busy establishing routines and getting the daily work done. Cooperative groups are more likely to be effective, and can allow more time for discussions than less effective groups (West *et al.*, 2004). Groups characterized by cooperative behavior show more reflectivity than less cooperative groups (Edmondson, 1999; Lantz and Brav, 2007; Tjosvold *et al.*, 2004). *H2a* postulates that cooperation will impact reflectivity.

Interpersonal understanding, informal interactions, psychological safety and a generally amicable climate where people feel free from pressure have shown to be related to collective reflectivity and learning (Claxton, 1998; Edmondson, 1999; Kozlowski and Bell, 2003; Lantz and Brav, 2007). A good social climate impacts on reflectivity as it allows group members to freely raise critical issues without fearing potential threats or embarrassment. Reflectivity and creativity occur when group members feel safe and experience others’ support and a generally amicable climate (Edmondson, 1999; West *et al.*, 2004). *H2b* postulates that social support will impact reflectivity.

Constructive controversy about task-related issues is part of a redefinition process from which the group finds the motivational force to take initiative to change (de Dreu and West, 2001). Such controversy is more likely to occur in a cooperative context where members rely on everyone’s willingness to contribute to reach a shared goal than in a non-cooperative group (Tjosvold, 1991). Effective work routines and good cooperation will impact the group members’ beliefs in the group’s capacity to solve problems, and group efficacy has shown to be essential for effective group work (Kozlowski and Bell, 2003). Good cooperation can be a starting-point for going beyond the stipulated task as it is likely to impact the group members’ willingness to invest in doing more than the stipulated work. *H3a* postulates that cooperation will impact group initiative.

A group climate characterized by openness and positive affectivity is related to idea generation, initiative-taking and innovation (North *et al.*, 2006; West *et al.*, 2004). The psychological reason is likely to be similar, or the same, as to why a good social climate enhances reflectivity. To collectively redefine work and discuss underlying motives, work objectives and alternative ways of carrying out the work is intellectually challenging. Such discussions are unlikely to occur in a tense or unsupportive atmosphere. Further, it is likely that one is more motivated to expand one's work role in a setting where one feels at ease, than in a group where one is critical towards, dislikes or has no trust in one's fellow workers. *H3b* postulates that social support will impact group initiative.

The group needs to come up with ideas about what needs to be changed in order to implement meaningful change. It is difficult to see how this can be done without discussions and collective reflectivity upon the current state of affairs. Previous research on proactive behavior stresses the importance of dialogue and reflectivity for initiative-taking (Hacker, 2003; Leiponen, 2005; Tjosvold, 1991; West *et al.*, 2004). West *et al.* (2004), among others, suggest team reflectivity as the means to achieve the motivational force to go beyond the stipulated work and regard reflectivity as a key factor when explaining initiative-taking and innovative work in groups. *H4a* postulates that reflectivity will impact group initiative.

Self-organizational activities presuppose that the group forms a strategy to implement change and this process will demand discussions and reflectivity (Leiponen, 2005; West *et al.*, 2004). Previous research showed a relationship between reflectivity and change and developmental work (North *et al.*, 2006). Reflectivity is an essential part of any creative activity to change the present for the better. *H4b* postulates that reflectivity impacts on self-organizational activities.

Research on innovative work provides evidence that group members need to be intrinsically motivated to bring about meaningful and sustainable change (West *et al.*, 2004) and personal initiative is such a motivational force (Crant, 2000). Without group initiative to implement change no self-organizational activities will occur. Personal initiative is positively related to innovative work in terms of active coping strategies, having ideas and submitting suggestions for improvements, and error handling (Speier and Frese, 1997) and changes in work characteristics (Frese *et al.*, 2007). *H5* postulates that group initiative impacts on self-organizational activities.

### *1.3 Is proactive behavior always beneficial?*

So far, the argument has been that initiative-taking and self-organizational activities are beneficial both from for the enterprise and in terms of work place learning. However, there are enterprises where it can be ineffective or even dangerous if individuals or groups involve themselves in self-organizational activities. The proposed model (Brav *et al.*, 2009) is expected to be applicable within a limited domain. To test the model's generalizability and meaningfulness, four studies were conducted in three organizational contexts where self-organizational activities are welcomed, and in a nuclear plant where readiness, alertness and initiative-taking are crucial, but self-organizational activities can endanger safety. From the perspective of a systems model, Dekker (2005) and Hollnagel (2004) argue that the concept of control and highly regulated work is overrated for risk prevention:



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In order to control effectively, any controller needs a good model of what it is supposed to control, and it requires feedback about the effectiveness of its control. But such internal models of the controllers easily become inconsistent with, and do not match the system to be controlled (Dekker, 2005, p. 10).

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Research on safety critical work and safety climate identify autonomy and proactivity as essential for coping with unexpected situations (Clarke, 2006; Grote, 2007). It can involve applying regulations in a flexible way in order to prevent risks or accidents. This is however somewhat different than self-organization: on one own's initiative, implement changes in work routines and how the work is regulated. Self-organization presupposes autonomy in influencing the means and the goals. It is beyond the aim of this study to investigate the scope of beneficial autonomy and self-organizational activities in nuclear plants. In the nuclear plant, the model ought not be applicable as self-organizational activities were regarded as a safety risk and prohibited, but proactivity in identifying risks, handling risks and error handling in relation to strict regulations were welcomed. The results are compared to the results of the first study (Brav *et al.*, 2009).

## 2. Method

A longitudinal design would have been preferable as self-organization implies redefinition of and change to work content and work conditions. This was not possible, and the dilemma was tackled by using a design where work groups with identical task instructions were compared, see below. The chosen groups can be regarded as semi-autonomous (see inclusion criteria below). If a work group has little autonomy, collective reflectivity on habitual routines is not very meaningful as the group cannot influence these and proactivity is not likely to be possible. The groups all had a certain degree of autonomy, but only autonomy in choosing the means. The range still covers quite a span of autonomy. The range restriction could be a problem if the relations between dimensions of job design, group processes, group initiative and self-organizational activities, differed in the lower range compared to the upper, or if there were trends in opposite directions. There is nothing in the literature that indicates that this should be the case.

### 2.1 Participants

The results are based on the first study conducted in four similar manufacturing enterprises (Brav *et al.*, 2009), a manufacturing enterprise (study 2), a large secondary school (study 3), homes for the elderly (study 4) and a nuclear plant (study 5), in Sweden. The manufacturing companies (study 1 and 2) were part of large multi-national companies with different branches in Sweden. The participants were all doing assembly work (robots, train engines, equipment for the commercial nuclear electric power industry). Teamwork was well established in the production.

In recent years a team-based organization has been introduced in many Swedish schools. Science can, for example, be taught mainly in English and different subjects can be taught side by side in a project regarding, for example, environmental issues. Teachers with different specialties can be responsible for the planning and execution of goal-setting, planning, teaching, and evaluation for a larger group of children who are (most of the time) divided into different sub-groups. The participants in study 3

worked in a large municipal upper secondary school specializing in vocational programs.

The homes for the elderly were three smaller units specializing in care for patients with psychiatric or dementia diagnoses and part of a city's overall organization for health care. The different teams were responsible for a smaller group of patients in order to ensure continuity in the relations to the patients, stable routines and a calm atmosphere.

The teams in the nuclear plant worked in three different departments within the production and their main task was maintenance work.

The organizations were chosen to simply represent different sectors, organizational structures and cultures. The organizations were selected based on similar criteria:

- (1) Production/work planning (planning close to and in cooperation with employees).
- (2) Work-organizational solutions (workgroups with a manager responsible for several workgroups).
- (3) Organizational support to the groups in the form of opportunities for competence development.
- (4) Selection criteria for group composition (no specific or deliberate selection of group members based on demographic variables, ethnicity, personality, or differences in previous work experience).
- (5) Identical task instructions (to carry out a specific given, and previously stipulated task with a defined expected outcome).

The groups were selected based on the following inclusion criteria:

- (1) Regular meetings at least once a week with opportunities for spontaneous discussions.
- (2) The group could decide which work routines would be the most effective.
- (3) The group was allowed to organize its daily work.
- (4) Administrative tasks and different responsibilities were rotated among group members.
- (5) The group did not have a leader functioning as a coach or specifically focusing on intra-group interaction.
- (6) All members worked day time or the same shift and had the same principal work task.
- (7) Group composition had been stable for at least six months.
- (8) In studies 1 and 2: the group practiced work task rotation.

In Table I the different study groups are described.

The final study groups comprised groups that met the above criteria. The number of selected groups varied between 55 percent (study 4) to 88 percent (study 2) of all work groups. These groups were asked to participate and all group members received a letter describing the study as well as ethical aspects. Further information was given when the survey was administered and in all studies except for in the nuclear plant, this was done by the research team. At the nuclear plant a contact person conveyed the



	Study 1 Manufacturing industry 1	Study 2 Manufacturing industry	Study 3 School	Study 4 Care for the elderly	Study 5 Nuclear plant
<i>Work groups</i> <sup>a</sup>					
<i>n</i>					
Out of in total <i>n</i>	31 42	36 41	12 16	10 18	15 21
<i>Numbers of participants</i> <sup>a</sup>					
<i>n</i>					
Out of in total <i>n</i>	171 239	189 218	88 114	74 172	122 189
<i>Number of participants</i>					
<i>n</i>					
Out of in total <i>n</i>	162 171	182 189	82 88	68 74	89 122
Response rate %	95	96	93	92	73
Range of work group size	3-11	3-9	3-8	4-11	6-9
Mean size	5	6	6	7	7
Percentage of women	17	29	56	94	7
Percentage of men	83	71	44	6	93
Average organizational age (years)	10	7	8	6	14
<b>Note:</b> <sup>a</sup> See selection criteria					

**Table I.**  
Participants in the  
different studies

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same information. Participation was voluntary and the surveys were completed in work time. The response rate varied between 73 percent (study 5) to 96 percent (study 2). Gender composition varied between male dominated groups (studies 1 and 2) to female dominated groups (study 4). The organizational age varied between an average of seven years (study 2) to 14 years (study 5). The questionnaires were coded and only the code numbers were matched with the work groups in order to ensure confidentiality.

Work task analysis was conducted in the manufacturing industries (studies 1 and 2). It was not possible to carry out work task analysis in all studies for a variety of reasons. At the introductory meeting, the teachers took a vote against the procedure. Their argument was that they did not feel comfortable with their work being observed. The head for the elderly care unit decided it would involve too much administrative time for the supervisors since all patients (or their families) had to give consent for ethical reasons. In the nuclear plant the research team was not allowed on the premises for security regulations. Therefore, in two studies the results are based on work task analysis of dimensions of job design and in all studies on a survey measurement of autonomy. This makes it possible in studies 1 and 2 to compare the results based on work task analysis of five dimensions of job design with the results based on a survey measurement of autonomy.

## 2.2 Measures

*2.2.1 Work task analysis.* The REBA-instrument (in German: Rechnergestütztes Dialogververfahren zur psychologischen Bewertung von Arbeitsinhalten) is intended for the design and analysis of work content and job design (Pohlandt *et al.*, 2007; Richter *et al.*, 1999). It consists of a heterogeneous set of 22 variables that can be grouped into five theoretically and empirically related dimensions (completeness, demand on cooperation, responsibility, cognition and learning). Completeness is measured as the organizational and technological conditions determining the sequential and hierarchical completeness of work. Demand on responsibility is measured as responsibility in terms of morally and legally specified liability and joint responsibility for performance outcome. Cooperation is measured in terms of forms of cooperation, amount of cooperation and content of communication. Demand on cognition is measured as participation in complex planning processes and demand on problem solving. Demand on learning is measured as continuous learning demands, the use of formal training and previous work experience (Lantz and Brav, 2007; Richter *et al.*, 1999).

The data are obtained by observing and putting additional questions to a trained worker carrying out his/her work. The overall task is described in the number of sub-tasks and the duration of each task is noted. A total of 12 variables are evaluated with regard to the overall task and ten are evaluated for each sub-task respectively. The different sub-tasks were weighted according to the time it took to carry out the specific task in relation to the total work time. The scales were standardized and each overall task receives a value based on the weighted task profiles (ten variables) and the evaluation of the overall task (12 variables). Each individual is matched with a profile for his/her job and it should be noticed that some individuals could have the same job. In studies 1 and 2, and when the group is the unit of analysis, the results are based on the mean values of the jobs carried out in each work group. The procedure of basing

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the analysis on the mean value of the job may be justified, as the mean value closely resembles the value of the principal work task (study 1  $r = 0.94$ ,  $p < 0.01$ ; study 2  $r = 0.89$ ,  $p < 0.01$ ). For a full description of items and scales, see Lantz and Brav (2007).

Observer reliability was attained by using the handbook for REBA work task analyses, by using two independent observers for the analyses, and in study 1 additional training procedures and supervision by an expert. The initial inter-rater agreement was in study 1, 93 percent, and in study 2, 89 percent. The discrepancies between observers (no more than one scale step in any evaluation) were further analyzed and discussed, then subjected to renewed assessment to reach absolute agreement.

*2.2.2 Survey measure.* Autonomy was captured by a set of six items frequently used and originally developed by Campion *et al.* (1993) for example:

Most work-related decisions are made by the members of my work group rather than my manager.

The six items measuring cooperation were originally designed by Campion *et al.* (1993), and Lantz and Laflamme (1996). They were chosen to capture workload sharing, work-task related information and communication about task-related issues in general, for example:

Everyone in our team does his/her fair share of work.

The five items measuring social support have been developed and used in earlier studies (Campion *et al.*, 1993; Edmondson, 1999; Lantz and Laflamme, 1996) and were chosen to capture social support, psychological safety and trust:

If you make a mistake in this team, it is often held against you (reversed).

The six items measuring reflexivity were constructed by Edmondson (1999) and Matsson (2001) for example:

In our team, someone always makes sure that we stop to reflect on the team's work process.

With the exception of three, all items capturing cooperation, social support and reflexivity were further tested by Lantz and Brav (2007).

Group initiative was measured using a set of six items developed by Frese *et al.* (1997), for example "We search for a solution immediately when something goes wrong". The items were transformed from individual to group level.

Frese *et al.* (1997, 2007) advocate the use of an interview procedure to capture personal initiative (PI). Others propose different survey measurements of proactive behavior ((role breadth self-efficacy (RBSE); taking charge (TC), proactive personality (PP)), see Crant (2000). In order to test the validity of using a survey measurement capturing personal initiative (transformed to group initiative) instead of a lengthy interview, and to compare different survey measurements of proactive behavior (PI, RBSE, TC, and PP), three exploratory studies were conducted (Eriksson and Löfman, 2008; Hadzic and Junno, 2008; Skog, 2008). It was concluded that the different measurements seem to represent one construct. Further, as the interview and survey measurement of PI do not provide significantly different data,

the use of a survey measurement of PI to capture proactive behavior can be justified (Lantz, 2008).

Self-organizational activities were measured with six items first tested by North *et al.* (2006), an example:

In our group we have initiated change of the framework and prerequisites (conditions) for our work in order to work in the most effective way.

All items were measured on seven-point Likert-type scale with 1 for “strongly disagree” and 7 for “strongly agree”.

A confirmatory factor analysis was conducted to determine whether the items of the six scales represented separate constructs. The results of the analysis employing maximum likelihood estimation are shown in Table II. The results show a model fit that was regarded as marginally sufficient (see Medsker *et al.*, 1994; Schumacker and Lomax, 2004). More importantly, the six-factor model showed better RMSEA and fit indices than the one- to six-factor solutions (see Table II).

Correlation coefficients were calculated by Pearson’s formula. Internal consistency values (Cronbach’s alpha) are all satisfactory and varying in the different samples between: job design 0.89-0.91; autonomy 0.59-0.82; cooperation 0.79-0.92; social support 0.87-0.91; reflexivity 0.77-0.84; group initiative 0.85-0.94 and, self-organizational activities 0.84-0.88. As the dimensions of job design are highly inter-correlated in studies 1 (0.91) and 2 (0.89), as well as in earlier research (Brav *et al.*, 2009; Lantz and Brav, 2007; Pohlandt *et al.*, 2007), the dimensions are in the further analysis treated as one measurement of job design.

*2.2.3 Reliability in group measurements.* To test the reliability in the group measures the intra-class coefficients ICC1 and ICC2 were computed by one-way ANOVAS (Bliese, 2000). The results varied between indexes and studies, see Table III. With two

**Table II.**  
Comparison of  
confirmatory factor  
analysis solutions in five  
different studies

Model, see Figure 1	$\chi^2$	df	RMSEA	CFI	NFI
Six factor: autonomy, cooperation, social support, reflexivity, group initiative, self-organizational activities	1,124	454	0.07	0.87	0.87
Five factor: (autonomy + cooperation), social support, reflexivity, group initiative, and self-organizational activities	1,570	458	0.10	0.78	0.73
Four factor: (autonomy + cooperation + social support) reflexivity, group initiative, and self-organizational activities	1,364	427	0.09	0.81	0.75
Three factor: (autonomy + cooperation + social support + reflexivity), group initiative and self-organizational activities	1,712	461	0.12	0.76	0.70
Two factor: (autonomy + cooperation + social support + reflexivity + group initiative) and self-organizational activities	1,896	462	0.13	0.73	0.67
One factor: (autonomy + cooperation + social support + reflexivity + group initiative + self-organizational activities)	1,984	459	0.13	0.71	0.65

**Note:**  $n = 516$

	ICC2	ICC1	F-value	Teamwork on the line can pay off
<i>Autonomy</i>				
Study 1	0.56	0.18	2.56 **	
Study 2	0.52	0.16	2.10 **	
Study 3	0.56	0.18	2.30 **	
Study 4	0.54	0.18	2.52 **	
Study 5	0.27	0.04	1.36	<b>87</b>
<i>Cooperation</i>				
Study 1	0.58	0.07	1.83 *	
Study 2	0.54	0.10	1.68 **	
Study 3	0.80	0.39	4.90 **	
Study 4	0.70	0.25	3.34 **	
Study 5	0.60	0.14	2.17	
<i>Social support</i>				
Study 1	0.55	0.10	1.76 *	
Study 2	0.51	0.08	1.50 *	
Study 3	0.82	0.43	5.59 **	
Study 4	0.67	0.23	3.05 **	
Study 5	0.50	0.11	1.64	
<i>Reflexivity</i>				
Study 1	0.54	0.11	2.62 **	
Study 2	0.50	0.10	1.62 *	
Study 3	0.76	0.35	4.34 **	
Study 4	0.50	0.10	1.80 *	
Study 5	0.50	0.09	1.58 *	
<i>Group initiative</i>				
Study 1	0.59	0.16	1.75 *	
Study 2	0.61	0.27	1.59 *	
Study 3	0.77	0.36	4.36 **	
Study 4	0.56	0.12	1.58 *	
Study 5	0.58	0.15	0.39 **	
<i>Self-organizational activities</i>				
Study 1	0.61	0.21	3.27 **	
Study 2	0.71	0.29	3.46 **	
Study 3	0.71	0.29	3.38 **	
Study 4	0.54	0.21	2.60 *	
Study 5	0.07	0.00	0.93	
<b>Notes:</b> * $p < 0.05$ ; ** $p < 0.01$				<b>Table III.</b> Intraclass correlation coefficients for survey measures

exceptions (study 5, the nuclear plant, and indexes autonomy and self-organizational activities) ICC1 showed significant  $F$ -ratios over 1 for all indexes in all studies, and significant  $F$ -ratios have previously been used in research to justify aggregation (Richter *et al.*, 2005). All indexes (but study 5, and indexes autonomy and self-organizational activities) reached the recommended ICC2-value of 0.50 or above. The conclusion was that it is justifiable to aggregate individual data to group data for studies 1-4.

### 3. Results

The hypothesized path model (Figure 1) was tested using LISREL 8.30 (Jöreskog and Sörbom, 1993) and employing maximum likelihood estimation on the covariance matrix. As the reliability estimates of the manifest variables affect the parameters in the model, the error variances of the manifest variables were calculated using the reliability estimates (Cronbach alpha) (see Jöreskog and Sörbom, 1993, pp. 37-38). This procedure allows an analysis of the linear structural relations among the latent rather than the manifest variables. Model fit was evaluated by using  $\chi^2$  tests first, but as sample size affects the  $\chi^2$  value, the root mean square error of approximation (RMSEA), where  $\leq 0.05$  indicates good fit (Schumacker and Lomax, 2004), and comparative fit index (CFI), where  $\geq 0.90$  is considered indicative of good fit (Medsker *et al.*, 1994), normed fit index (NFI) and non-normed fit index (NNFI) where  $\geq 0.90$  is considered indicative of good fit were used as well. In small samples RMSEA  $\leq 0.10$  is acceptable, as well as lower NFI, NNFI- and CFI-values (Tabachnick and Fidell, 2007).

Individual data could be aggregated to group data in studies 1-4, but the number of groups was small in studies 3, 4 and 5. In order to make comparison between the samples possible, the hypothetical model was tested on individual data in all studies and on group data in studies 1 and 2 as well. It is argued, that if the results based on individual and group data in study 1 and 2 are similar, and if the results based on individual data of the different studies are similar, it can be justified to draw a conclusion about the model's validity for both individuals working in groups and for workgroups. Further, it can be justified to test the model on data from the merged studies 1-4, and with both the individual as well as the group as the unit of analysis. The results are presented in Table IV.

#### 3.1 The results of the SEM-analysis in the separate studies 1-5

The path between cooperation and reflectivity was insignificant in studies 1, 2, 4 and 5. The final model was obtained by omitting the insignificant path between cooperation and reflectivity and rerunning the model. In study 3 the path was significant and the final model is identical with the hypothetical model. The inter-correlation between cooperation and social support varied between 0.29-0.78 and were in all studies significant.

*3.1.1 A model based on autonomy captured with a survey and tested on individuals working in groups.* We expected that the model should not be applicable to a setting where the work is highly regulated and self-organizational activities are not welcomed, and this was confirmed in study 5 ( $n = 89$ ):  $\chi^2(7) = 22.77, p = 0.00$ , RMSEA = 0.18.

Studies 1-4: *H1b* is confirmed in studies 1-4. *H2a* is rejected in studies 1, 2, 4. It is confirmed in study 3. *H2b*, *H3a*, *H3b*, *H4a* and *H5* are all supported. *H4b* is supported in studies 1, 2 and 4.

*3.1.2 A model based on autonomy captured with a survey and tested on work groups.* Studies 1 and 2: *H1b* is supported in study 1 but not in study 2. *H2a* is rejected. The path from social support to reflectivity (*H2b*) is almost significant in study 2 ( $p = 0.08$ ), but not in study 1. *H3a*, *H3b*, *H4b* and *H5* are confirmed in both studies. The path from reflectivity to group initiative (*H4a*) is almost significant in study 1 ( $p = 0.09$ ), but it is insignificant in study 2. To summarize: *H3a*, *H3b*, *H4ab* and *H5* are confirmed. There is some support for *H1b* and *H4a*.



Study and model fit	H1	H2a	H2b	H3a	H3b	H4a	H4b	H5
Study 1 ( $n = 171$ ). Autonomy (self-assessment) $\chi^2(7) = 16.28$ , $p = 0.02$ , RMSEA = 0.08, and CFI = .98, NFI = 0.96, NNFI = 0.95	0.21*	–	0.30*	0.48**	0.28*	0.20*	0.33**	0.33**
Study 2 ( $n = 189$ ). Autonomy (self-assessment) $\chi^2(7) = 11.98$ , $p = 0.10$ , RMSEA = 0.07, and CFI = 0.99, NFI = 0.97, NNFI = 0.98	0.29*	–	0.26*	0.49**	0.19*	0.19*	0.28*	0.29*
Study 3 ( $n = 82$ ). Autonomy (self-assessment) $\chi^2(7) = 6.96$ , $p = 0.33$ , RMSEA = 0.05, and CFI = 0.99, NFI = 0.97, NNFI = 0.98	0.26*	0.19*	0.57**	0.32*	0.36**	0.34*	–0.05ns	0.57**
Study 4 ( $n = 74$ ). Autonomy (self-assessment) $\chi^2(7) = 3.83$ , $p = 0.80$ , RMSEA = 0.000, and CFI = 0.99, NFI = 0.97, NNFI = 0.98	0.17*	–	0.32*	0.37**	0.16*	0.38**	0.42**	0.40**
Study 1 ( $n = 31$ ). Autonomy (self-assessment) $\chi^2(7) = 8.01$ , $p = 0.33$ , RMSEA = 0.07, and CFI = 0.98, NFI = 0.91, NNFI = 0.95	0.29*	–	0.16ns	0.37*	0.39*	0.21†	0.49**	0.33*
Study 2 ( $n = 36$ ). Autonomy (self-assessment) $\chi^2(7) = 5.47$ , $p = 0.36$ , RMSEA = 0.05, and CFI = 0.99, NFI = 0.96, NNFI = 0.98	0.06ns	–	0.26†	0.57**	0.33*	0.05ns	0.81**	0.40*
Study 1 ( $n = 171$ ). Dimensions of job design captured by work task analysis $\chi^2(340) = 583$ , $p = 0.00$ , RMSEA = 0.09, and CFI = 0.98, NFI = 0.92, NNFI = 0.96	0.36**	–	0.36*	0.43**	0.29*	0.14ns	0.20*	0.20*
Study 2 ( $n = 189$ ). Dimensions of job design captured by work task analysis $\chi^2(7) = 12.19$ , $p = 0.09$ , RMSEA = 0.07, and CFI = 0.98, NFI = 0.96, NNFI = 0.96	0.32*	–	0.33**	0.50**	0.20*	0.19*	0.27*	0.29*
Study 1 ( $n = 31$ ). Dimensions of job design captured by work task analysis $\chi^2(7) = 7.3$ , $p = 0.40$ , RMSEA = 0.04 and CFI = 1.0, NFI = 1.0, NNFI = 1.0	0.48**	–	0.28†	0.30*	0.57**	ns	51**	25†
Study 2 ( $n = 36$ ). Dimensions of job design captured by work task analysis $\chi^2(7) = 7.49$ , $p = 0.91$ , RMSEA = 0.000, and CFI = 1.0, NFI = 0.97 and NNFI = 1.1	0.31*	–	0.55**	0.57**	0.38*	–0.09ns	0.83**	0.40*
Study 1-4 ( $n = 494$ ). Autonomy (self-assessment) $\chi^2(7) = 8.01$ , $p = 0.33$ , RMSEA = 0.07, and CFI = 0.99, NFI = 0.97, NNFI = 0.98	0.15*	ns	0.41**	0.32**	0.41**	0.14*	0.29**	0.31**
Study 1-4 ( $n = 104$ ). Autonomy (self-assessment) $\chi^2(7) = 11.09$ , $p = 0.39$ , RMSEA = 0.04, and CFI = 0.99, NFI = 0.98, NNFI = 0.98	0.19*	ns	0.44**	0.32**	0.43**	0.16*	0.29**	0.34**

**Notes:** † $p < 0.10$ ; \* $p < 0.05$ , \*\* $p < 0.01$ , two-tailed

**Table IV.**  
Tests of the hypothesized model: final model fit and standardized regression weights for paths representing H1-H5

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*3.1.3 A model based on dimensions of job design captured with work task analysis and tested on individuals working in groups.* Studies 1 and 2: *H2a* is rejected. *H1a*, *H2b*, *H3a*, *H3b*, *H4b* and *H5* are confirmed in both studies. *H4a* is confirmed in study 2.

*3.1.4 A model based on dimensions of job design captured with work task analysis and tested on work groups.* Studies 1 and 2: *H1a* is supported in studies 1 and 2. *H2a* is rejected. In study 1 the path (*H2b*) from social support to reflectivity was almost significant ( $p = 0.6$ ), and significant in Study 2. *H3a*, *H3b*, and *H4b* are supported in both studies. There was no support for *H4a*. The path (*H5*) from group initiative to self-organizational activities was almost significant in study 1 ( $p = 0.09$ ), and significant in study 2. In conclusion, *H1a*, *H2b*, *H3a*, *H3b*, *H4b*, and *H5* are regarded as supported.

### *3.2 The results of the SEM-analysis in the merged studies 1-4*

*3.2.1 A model based on autonomy captured with a survey and tested on individuals working in groups.* Study 1-4 merged ( $n = 494$ ): *H2a* is rejected. All other hypotheses are confirmed.

*3.2.2 A model based on autonomy captured with a survey and tested on groups.* Study 1-4 merged ( $n = 104$ ): *H2a* is rejected. All other hypotheses are confirmed.

### *3.3 Summary*

Table IV shows that the final model provides substantial, although not complete, support for the theoretical model. Model fit varies from very good to acceptable (RMSEA: 0.000–0.09; CFI: 1.0–0.98; NFI: 1.0–0.91; NNFI: 1.0–0.95). *H1a* is confirmed in studies 1 and 2. *H1b* is confirmed in all studies except for study 2 (the group as the unit of analysis). *H2a* is confirmed only in one study. *H2b* is confirmed in study 1 (individuals) and in studies 2-4. *H3a* and *H3b* are confirmed in all studies.

*H4a* is confirmed in studies 1 and 2 (individuals and autonomy), and studies 3 and 4. *H4b* is confirmed in studies 1, 2, and 4. *H5* is confirmed in all studies but study 1 (job design and groups) where there is a tendency for group initiative to impact on self-organizational activities.

The model tested on groups as the unit of analysis (studies 1 and 2) shows better fit (due to a smaller variance) than when tested on the individual as the unit of analysis. The model with dimensions of job design captured with work task analysis shows better fit than a model with autonomy captured by self-assessment (studies 1 and 2) when based on the group as the unit of analysis. The impact of job design (work task analysis) on reflectivity is larger than that of autonomy (survey measurement) in studies 1 and 2.

When the studies were merged all hypotheses, but *H2a*, were confirmed, both when tested on individuals working in groups as well on groups as the unit of analysis.

In conclusion: The 12 analyses carried out on both groups as well as on individuals working in groups provide support for all hypotheses but *H2a*.

## **4. Discussion**

The aim of the study was to test and give empirical support to a previously proposed model of the determinants of self-organizational activities in workgroups (Brav *et al.*, 2009). In the model dimensions of job design, group processes and proactive behavior are interrelated and connected to self-organizational activities. The assumptions were

that job design and autonomy will affect not only stipulated work, but also whether the group, through collective reflectivity, will redefine their work, expand their role and take the initiative to implement meaningful change. Further, that good cooperation and an amicable working climate will enhance reflectivity and that the group will find the motivational force to go beyond the stipulated work. The model was tested in four studies in different organizational contexts (industry, school, an elderly care unit and a nuclear plant) and the results were compared to the results of the first study (Brav *et al.*, 2009). The results are based on in total 104 work groups. The response rate was very high in studies 1-4 and acceptable in study 5, and the difference was probably due to the fact that the research team did not visit the nuclear plant. It was expected that the model should be generalizable only to contexts where self-organizational activities are welcomed.

The theoretical path model received substantial support, but did not support the assumption that cooperation affects reflectivity. In an industrial context the model shows a better fit when the input-variable is captured as a dimension of job design rather than autonomy. Further, in such a setting, dimensions of job design have a larger impact on reflectivity than on autonomy. The model gets substantial support also when the input-variable is assessed as autonomy, but in such a model the results are not as consistent as to what impact autonomy has on reflectivity. This seems to be related to the different contexts, but all in all the impact is not very large. We find support for all hypotheses but the results are not fully consistent. There is enough support to be able to say that *H1a*, *H1b*, *H2b*, *H3a*, *H3b*, *H4b* and *H5* are confirmed, and there is support in one study for *H2a*. A model which is applicable in contexts where it theoretically should not be is meaningless. The results show that the model makes sense, as it is applicable in a context where degrees of freedom, good processes and reflectivity should encourage employees to engage in self-organizational activities. It is not applicable in a context where self-organization is regarded to be a threat to overall goals, such as in the nuclear plant. Most studies within the domain of work and organizational psychology have been conducted in male-dominated industrial organizations. The gender composition of groups differs between industry, school, and care for the elderly and the results indicate that this does not have an impact on the model.

In the model group, processes mediate the relation between the prerequisites for group work and the outcome and our results are in line with extensive previous research (Kozlowski and Bell, 2003; Stewart, 2006; West *et al.*, 2004).

Different methods were used for measuring dimensions of job design and group processes and outcome-variables in two of the studies. The argument is that detailed work task analysis is worthwhile as it provides data on the prerequisites for group work regardless of how these conditions are perceived, and gives a solid base for proposing how the work should be designed if it is to support proactive behavior. A reviewer of a previous article (Brav *et al.*, 2009) raised the question: "why is there all this fuss about work task analysis if a subjective measurement of autonomy explains as much?" The results indicate that it does not. There are two arguments for this. First, the impact of five dimensions of job design captured by work task analysis is greater on reflectivity than that of self-assessment of autonomy in studies 1 and 2. Secondly, one has to bear in mind the effects of priming and consistency. Data collected with a single method, such as a survey, can lead to problems with common method variance

(Campell and Fiske, 1959). Results based on studies where different methods are used would be expected to show lower correlations between variables in comparison to single method studies, as the mean variance due to common method variance is less (Buckley *et al.*, 1990).

In the literature there is support for the hypothesis that cooperation affects reflectivity in groups (Lantz and Brav, 2007; Kozlowski and Bell, 2003; Edmondson, 1999) but the results do not support this. It might be the case that cooperation, through the interrelations between cooperation and the social climate, indirectly affects reflectivity, and not directly as in the proposed model. The impact of cooperation on reflectivity needs to be explored further. Reflectivity is an important determinant of self-organizational activities, which is totally in line with previous research on innovative work (West *et al.*, 2004).

#### 4.1 Limitations

Some of the bivariate correlations between variables are high, but as they are lower than 0.90 and the survey data showed independent dimensions, the path analysis can be justified.

The measurement used in our study to capture group initiative seems to be valid and comparable to the interview proposed by Frese *et al.* (2007). This is not to claim that a few items obtained from a survey are the same as the rich information derived from a lengthy interview. It is not very plausible that the results are affected by the lack of validity in the instrument used, but the above discussion about the effects of priming and consistency is of course relevant for studies 3-5.

It was not possible to carry out work task analysis in three of the studies due to resistance from staff and management. Work task analysis provides detailed information on dimensions, among them cognitive demand that are not easily captured by surveys. The procedure involves observations of work. The participant might feel that it is he or she, rather than the work task, who is being "analyzed", and confidentiality issues are more difficult to handle. In the school system there is a fierce debate raging regarding teachers' right to work from home.

It is a qualified guess that some of the teachers were suspicious that the employer would use the results of the work task analysis to find evidence to argue that teachers should have a 9-5 job. In hindsight it would have been preferable to choose schools where there is no conflict about self-regulated work hours, and to choose organizations where no third party is involved, as in the home for the elderly, as this involves different confidentiality issues. However, these kinds of work and female-dominated workplaces are less studied from the perspective of job design than male-dominated workplaces like heavy industry.

Five different studies with a relatively small number of groups do not make up a large sample, but the data could be merged and together the sample size is large enough to provide substantial support for the model. However, it should be tested in different organizational contexts where it is possible to carry out a work task analysis.

#### 4.2 Future research

Frese *et al.* (2007) show how an individual's aspirations for control affects personal initiative and self-efficacy is a central concept in the redefinition process. The presented model needs to be developed so that the relations between group efficacy

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(collective efficacy or potency) and group initiative are explored. Further, a longitudinal study in line with the approach of Frese *et al.* (2007) and with different data collection methods for job design, group initiative and self-organizational activities would give both input to theory-building and provide better support for the proposed model.

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#### 4.3 Practical implications

Many managers recognize the importance of employees' proactive behavior. Lack of initiative-taking is often regarded as a question of attitudes or motivation. A careful examination of job design can give substantial input as to how work conditions might be altered to enhance innovation processes. This study, in line with substantial research, shows that job design has a substantial effect on group processes that are crucial for learning the competence to handle change. Researchers and consultants could perhaps do more to help enterprises identify those parameters in job design that will do most to promote proactivity. Designing a good job is perhaps an easier task than changing peoples' attitudes and motivation.

Work task analysis is a structured method for evaluating work and can be used for assessing demand on competence. One industry has taken an interest in developing a competence-based remuneration system based on the evaluation of different work tasks.

Teamwork is a complicated work organizational solution and there is a tendency to go back to conventional line-production. A good argument for investing in teamwork is that it promotes self-organization. Employees learn to think outside the box and proactively take initiatives that go beyond a limited interpretation of their job description and participate in processes that are important for innovation. The study provides further evidence for the argument that job design is essential if teamwork on the line is to pay off further down the line. Learning to manage change is essential for both the organizations' competitiveness and for the individual's long term employability.

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